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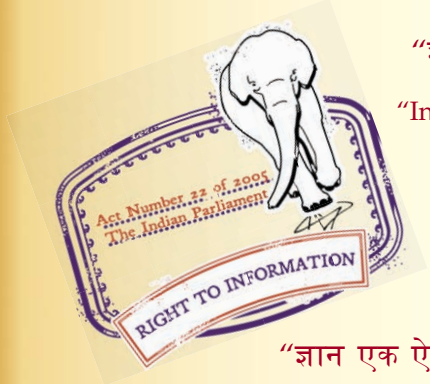


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"Knowledge is such a treasure which cannot be stolen"

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# *Indian Standard*

# APPROVAL TESTS FOR WELDING PROCEDURES

## PART I FUSION WELDING OF STEEL

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NEW DELHI 110002

Gr 5 *October* 1974

# *Indian Standard*

# APPROVAL TESTS FOR WELDING PROCEDURES

## PART I FUSION WELDING OF STEEL

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# *Indian Standard*

# APPROVAL TESTS FOR WELDING PROCEDURES

## PART I FUSION WELDING OF STEEL

## 0. FOREWORD

**0.1** This Indian Standard ( Part I ) was adopted by the Indian Standards Institution on 29 March 1974, after the draft finalized by the Welding General Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** This standard is one of a series of Indian Standards on the approval testing of welders and welding procedures, the latter having a bearing on the former for certain applications. This link has been used as a means of arranging the series of standards into:

a) welder approval when the welding procedure is not required to be approved ( for either technical or contract reasons ),

b) approval testing of welding procedures, and

c) welder approval when welding procedure approval is required.

**0.3** For the purposes of this standard, the welder who makes the welding procedure test is considered to be sufficiently experienced in the appropriate welding process and hence already capable of passing training tests such as those contained in IS : 817-1966*.

**0.4** To indicate the philosophy behind this series of standards, it is considered useful to give details of the practices relating to welding procedure approval. Depending upon the emphasis placed on quality control in the production of welded components, so may the approval of welding procedures be administered in one of several ways. The alternatives currently employed are the following:

a) Each individual contractor ( or sub-contractor ) should prove by actual test pieces every weld form he wishes to use, in every thickness and material; or

b) Each individual contractor ( or sub-contractor ) should prove by actual test pieces, a set of welds representative on a group basis, of all the various thicknesses and materials to be used in production; or

*Code of practice for training and testing of metal arc welders ( *revised* ).

c) Each individual contractor ( or sub-contractor ) need not make procedure test pieces providing he can prove by authentic documentation of an independent nature that he has previously welded the type of joint and material in question to give satisfactory service behaviour.

In respect of ( a ) and ( b ) it should be appreciated that once the welding procedure tests have been approved, they need never be repeated unless there is a change in certain variables. As an extension beyond ( c ), it may be possible in the future for fully documented welding procedures, developed independently of the particular contractor, to be employed without the need for further approval tests.

Although a welding procedure may already have been approved, each manufacturer should accept responsibility for the procedure used on a contract and for the ability of the welders to apply the procedure.

**0.5** In the formulation of this standard assistance has been derived from the draft British Standard 'Specification for approval testing of welding procedures, Part 1 Fusion welding of steel' ( Doc: 72/42576 DC ), issued by the British Standards Institution.

**0.6** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## 1. SCOPE

**1.1** This standard specifies requirements for the approval tests for welding procedures for the fusion welding ( *see* **3.3** ) of carbon and carbon-manganese steel, except castings. The approval testing of welding procedure for the fusion welding of steel casting are covered in IS : 5530-1969† and IS : 6916-1973‡.

## 2. DEFINITIONS

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Welding Procedure**§ — A specified course of action followed in welding including a list of materials and, where necessary, tools to be used.

*Rules for rounding off numerical values ( *revised* ).

†Code of procedure for repair and rectification of steel castings by metal arc welding process.

‡Code of practice for fabrication welding of steel castings.

§This definition has been extracted from IS: 812-1957 'Glossary of terms relating to welding and cutting of metals'.

**2.2 Welding Procedure Test** — The making and testing of a welded joint representative of that to be used in production in order to prove the feasibility of welding procedure for a specified application.

NOTE — This term is not usually applied to any tests that may have been made during the development of a welding procedure.

**2.3 Approved Welding Procedure** — A documented welding procedure that has been signified as approved for a specified application either by means of a welding procedure test or as a result of experience gained with the welding of joints similar to that to which the welding procedure applies.

**2.4 Test Piece*** — Components welded together in accordance with a specified welding procedure, or a portion of a welded joint detached from a structure, for test.

**2.5 Test Specimen*** — A portion detached from a test piece and prepared as required for testing.

## 3. ITEMS IN A WELDING PROCEDURE TEST

**3.1 General** — The items listed in **3.2** and the items in **3.3** relevant to the particular welding process shall be recorded for each welding procedure test.

NOTE — Not all of these items need be included in the approved welding procedure.

**3.2 Items for All Welding Processes** — Details relating to the following items shall be recorded for all welding processes:

a) Welding process or processes when more than one is used in making a complete joint.

b) Parent metal specification, thickness and for pipe† the outside diameter or dimension.

c) Shop or site conditions.

d) Sketch showing the edge preparation.

e) Cleaning, degreasing, etc.

f) Sketch showing fit-up.

g) Jigging or tacking, backing, etc.

h) Welding position ( including direction for vertical position ).

j) Make and type of welding consumables.

k) Filler material composition and size.

*This definition has been extracted from IS : 812-1957 'Glossary of terms relating to welding and cutting of metals'.

†In this standard the word 'pipe', alone or in combination, is used to mean 'pipe' or 'tube' or 'circular structural hollow section' ( circular or rectangular ), although these terms are often used for different categories of product by different industries.

m) Preheating and interpass temperature range, including method and control.

n) Travel speed ( mechanized welding ).

p) Sketch showing approximate number and arrangement of runs and weld dimensions.

q) Welding sequence.

r) Back gouging/back chipping.

s) Heat treatment before post-weld heat treatment.

t) Post-weld heat treatment, including method and control.

u) Any special features to meet particular service requirements.

**3.3 Items for Particular Welding Processes** — Details relating to the items given in **3.3.1** to **3.3.6** shall be recorded for the particular welding processes. For pipe welding, where back purging is used, the purge gas, flow rate of purge gas and period shall be recorded.

**3.3.1** *Manual Metal-Arc Welding*

a) Electrode designation.

b) Type of core wire.

c) Flux covering.

d) Nature of current ( ac or dc ) and polarity.

e) Current.

**3.3.2** *MIG Welding**

a) Electrode composition.

b) Shielding gas and flow rate.

c) Nozzle diameter.

d) Current.

e) Arc voltage.

f) Wire feed speed.

g) Electrode extension
h) Circuit inductance or setting
} Additional for dip transfer technique.

j) Nature of metal transfer — whether spray or dip transfer.

**3.3.3** *TIG Welding**

a) Tungsten electrode diameter/type.

b) Shielding gas and flow rate.

*For pulsed welding, the pulse time, pulse current and background current and voltage shall also be recorded.

c) Nozzle diameter.

d) Nature of current ( ac or dc ) and polarity.

e) Current.

f) Arc length or voltage for mechanized welding.

g) Purging gas.

**3.3.4** *Submerged Arc Welding and Continuous Covered Electrode Arc Welding with or Without* $CO_2$ *or Flux Shielding*

a) Number and configuration of electrode wires and electrical connections.

b) Electrode composition/flux combination if cored or covered wire.

c) Flux type.

d) Shielding gas and flow rate.

e) Electrode extension.

f) Nature of current ( ac or dc ) and polarity.

g) Current.

h) Arc voltage.

j) Power source characteristic.

k) Welding speed.

**3.3.5** *Electroslag and Consumable Guide Welding*

a) Number of electrodes.

b) Flux type.

c) Guide configuration.

d) Oscillation width and dwell periods.

e) Current ( wire feed speed ).

f) Polarity.

g) Voltage and vertical lift rate.

h) Slag depth.

**3.3.6** *Gas Welding*

a) Flux type.

b) Oxygen pressure.

c) Fuel gas and pressure.

d) Nozzle size.

e) Flame characteristic ( oxidizing, reducing or neutral ).

## 4. CHANGES AFFECTING APPROVAL

**4.1** A welding procedure test shall be required when any of the following changes are made to an approved welding procedure:

a) Any change in welding process;

b) Any change in parent metal, thickness or pipe outside diameter or dimension, subject to the extent of approval given in **5**;

c) Any change in root detail ( gap, root face or backing );

d) Any change in fundamental welding position, flat, horizontal-vertical, vertical, overhead ( *see* IS : 812-1957* for definitions ), that is, each fundamental welding position shall be separately approved;

NOTE — Care is required to distinguish between pipe positions and welding positions, as a pipe position may involve more than one welding position.

e) Any change in welding technique ( for example, a change from the vertical-upward method to the vertical-downward method );

f) Any change in type of electrode, filler material, flux or shielding gas;

g) Any change in the size of a manual metal-arc welding electrode used for the root run of an unbacked weld;

h) Any change of more than one-third in the size of a manual metal-arc welding electrode used for the root run of a backed weld;

j) A change in welding current from dc to ac or change in polarity;

k) A change in preheating temperature, except for an increase of less than 100°C; and

m) Any change in post-weld heat treatment.

Any change in the make or size other than under (g) or (h) above, of filler material or in the shielding or back purging gas shall be reported to the purchaser, but this will not necessarily require re-approval.

In the absence of any of the changes set out above, an approved welding procedure shall remain in force indefinitely.

## 5. EXTENT OF APPROVAL

**5.1 Parent Metal** — In respect of the following types of steel, approval of a welding procedure shall be given on a group basis:

*Group FE*1 — Mild and carbon manganese structural steels not requiring hydrogen controlled electrodes and/or heat imput controlled welding processes and preheating. Such steels would have a tensile strength in the range 410-510 N/mm$^2$ and a combined thickness of up to and including 80 mm.

*Glossary of terms relating to welding and cutting of metals.

*Group FE2* — Carbon and carbon manganese steels requiring hydrogen controlled electrodes and/or heat imput controlled welding processes and preheating. Such steels would have tensile strength in the range 510 to 610 N/mm² or would be Group FE1 steels having a combined thickness exceeding 80 mm.

**5.1.1** The approval of a welding procedure for a particular type of steel in Group FE1 or FE2 shall include approval for all the other steels in the same group, unless it has been stated in the enquiry or order that a separate welding procedure test for the particular steel is required. Approval between groups is not permitted.

**5.1.2** Separate welding procedure approval shall be required for each steel not covered by Groups FE1 and FE2. If dissimilar steels are to be welded a separate welding procedure test for the particular combination of materials shall be made.

**5.2 Thickness** — For gas welding, the approval of a welding procedure for material of thickness $t$ shall include approval for all thicknesses up to and including $t$.

For processes other than gas welding, the approval of a welding procedure for material of thickness $t$ shall include approval for thicknesses in the range $0{\cdot}75t$-$1{\cdot}5t$.

**5.3 Pipe Outside Diameter or Dimension** — The approval of a welding procedure for pipe of outside diameter or dimension $D$ shall include approval for diameters or dimensions in the range $0{\cdot}5D$-$1{\cdot}5D$. For rectangular hollow sections, $D$ shall be the dimension of the smaller side.

## 6. TEST PIECES

**6.1** Each type of joint to which the welding procedure will relate in production shall be represented by making an appropriate test piece or pieces, preferably selected from the following:

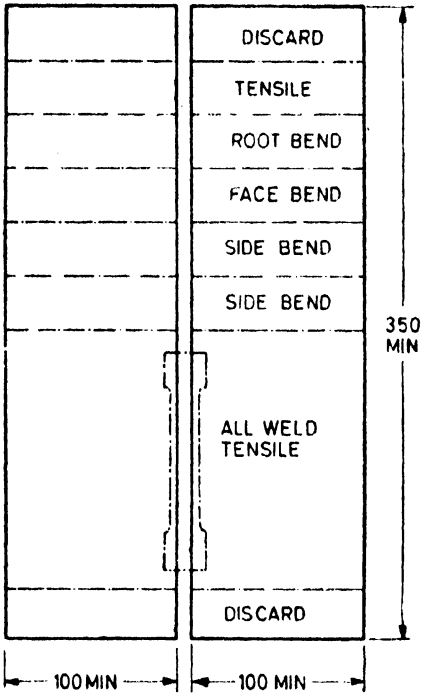
a) A butt joint ( plate or pipe ) ( Fig. 1 and 2);

b) A fillet weld ( plate ) ( Fig. 3 ); and

c) A branch connection ( pipe ) forming the most severe angle $\theta$, likely to be involved in production ( Fig. 4 ).

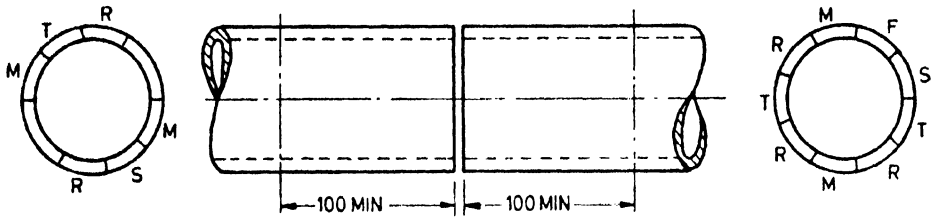
NOTE — Sometimes a butt joint is prepared in addition to a test piece of the types given in ( b ) and ( c ) above in order to obtain relevant test data.

**6.2** If the production joint design or application is such that none of the above types of test pieces could be regarded as representative, such as attachment welds to thin pipes or surfacing, then the enquiry and order shall state that a special test piece is required which shall simulate the production joint in all essential features, such as dimensions, restraint, access, heat sink effects and any special surface protection. Edge preparation and fit-up shall be as given in welding procedure ( *see* **3.1** ).




All dimensions in millimetres.

FIG. 1 TEST PIECE FOR BUTT WELD IN PLATE



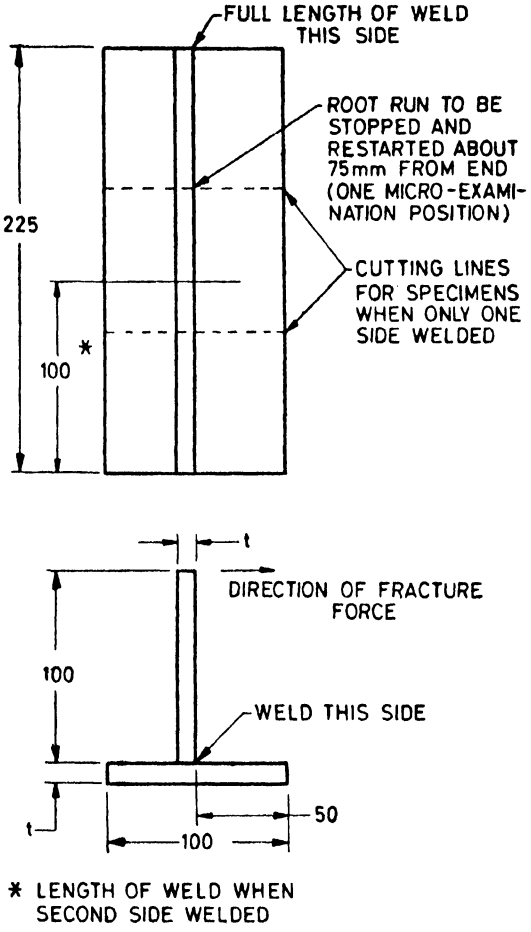

PIPES UP TO AND INCLUDING 88·9 mm OUTSIDE DIAMETER

PIPES OVER 88·9 mm OUTSIDE DIAMETER

$R$ = Root bend
$F$ = Face bend
$S$ = Side bend
$T$ = Tensile
$M$ = Macro

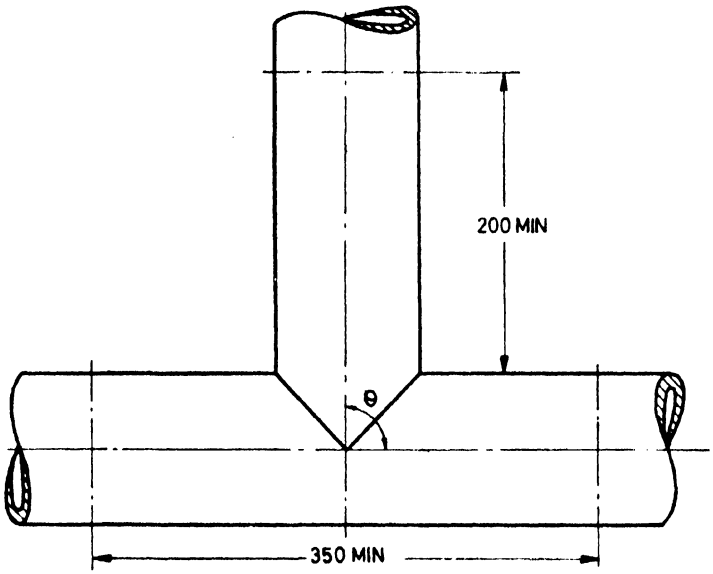
All dimensions in millimetres.

FIG. 2 TEST PIECE AND LOCATION OF TEST SPECIMENS FOR BUTT WELD IN PIPE




All dimensions in millimetres.

FIG. 3 TEST PIECE FOR FILLET WELD IN PLATE




All dimensions in millimetres.

FIG. 4 TEST PIECE FOR BRANCH CONNECTION IN PIPE

**6.3** The dimensions and number of test pieces shall be such as to provide for the appropriate test specimens given in Table 1.

**6.4** Subsurface defects that break the surface or which are revealed as the result of any grinding specified in the welding procedure shall not be repaired and there shall be no other repair welding of a completed test piece.

## 7. EXAMINATION AND TESTING

**7.1 General** — For a welding procedure to be approved, the same test piece(s) representing the welding procedure test shall satisfy the requirements for both non-destructive and destructive testing ( **7.2** *and* **7.3** ).

**7.1.1** If the test piece fails to satisfy any of the requirements for non-destructive testing given in **7.2.2**, one further test piece shall be welded and subjected to the same examination. If this additional test piece does not meet the required standard, the procedure shall not be regarded as capable of meeting the requirements of this standard without modification.

**7.1.2** If any test specimen fails to satisfy the relevant requirements given in **7.3.3**, two further test specimens for each one that failed shall be obtained, either from the same test piece if there is sufficient material

TABLE 1 TEST SPECIMENS*

( *Clauses* 6.3 *and* 7.3.1 )

| Sl No. | Test Specimen | Butt Joint in Plate | Butt Joint in Pipe of Outside Dia or Dimension | | Fillet Weld in Plate | Branch Connection in Pipe of Outside Dia or Dimension | |
|---|---|---|---|---|---|---|---|
| | | | Up to and Including 88·9 mm | Over 88·9 mm | | Up to and Including 88·9 mm | Over 88·9 mm |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1. | Macro-examination | 1 | 2 | 2 | 2 | 4† | 8† |
| 2. | Hardness survey‡ | 1 | 1 | 1 | 1 | 1 | 1 |
| 3. | Transverse tensile | 1 | 1 | 2 | — | — | — |
| 4. | All-weld tensile§ | 1 | — | — | — | — | — |
| 5. | Root bend | 1 | 2 | 3 | — | — | — |
| 6. | Face bend | 1 | — | 1 | — | — | — |
| 7. | Side bend ( for material at least 10 mm thick ) | 2 | 1 | 1 | — | — | — |
| 8. | Fillet weld fracture | — | — | — | 3 | — | — |

*When more than one specimen of a particular type is required, the specimens shall be taken as far apart as possible with one specimen for macro-examination taken from that part of the joint considered to have been welded in the most difficult welding position or from a stop/start position.

†For purely structural application the number of specimens may be reduced to 2 and 4 respectively.

‡The hardness survey shall be made on a macro-examination test specimen.

§To include high-temperature testing when appropriate.

available or from a new test piece, and subjected to the same test. If either of these additional test specimens does not meet the required standard, the procedure shall not be regarded as capable of meeting the requirements of this standard without modification.

**7.1.3** When any further test piece or test specimen fails to meet the required standard for non-destructive or destructive testing, the cause of failure shall be established. Dependent upon the results of the examination, the procedure shall either be modified or a new procedure approved. By agreement between the contracting parties, a modified procedure may be approved without the need for further test pieces to be welded.

### 7.2 Non-destructive Testing

**7.2.1** *Examination* — All test pieces shall be examined non-destructively after any post-weld heat treatment and prior to the cutting of test specimens.

All test pieces shall be examined visually followed by:

a) magnetic particle or penetrant testing ( *see* IS : 5334-1969* and IS : 3658-1966† ); and/or

b) ultrasonic and/or radiographic examination ( *see* IS : 4260-1969‡; IS : 1182-1967§ and IS : 4853-1968‖ );

depending upon joint geometry and material. The types of tests shall not be less than that required for production work, according to the requirements of the application standard where it exists.

**7.2.2** *Acceptance Levels* — Defects that are detected by visual examination and the other relevant methods of non-destructive testing shall be assessed in accordance with the details specified in Table 2. The existence of any defect greater than the maximum permitted by Table 2 shall be sufficient cause for rejection. Minor local defects, except cracks, which can be established as being due solely to the welder's workmanship need not be the cause for rejection.

NOTE 1 — Multiple type faults contained within the same weld, either superimposed or interposed, which are individually acceptable as isolated imperfections may be considered acceptable provided that investigation shows that there is nothing fundamentally wrong with the welding procedure.

NOTE 2 — It should be appreciated that the details given in Table 2 may be different from those specified for a particular application.

## 7.3 Destructive Tests

**7.3.1** *Test Specimens* — According to the type and size of test piece, the specimens to be obtained shall be as given in Table 1.

When the size and thickness of a pipe butt joint are such that the test specimens required cannot be obtained, then some other method of test as agreed between the contracting parties shall be used, for example a full size tensile test or a pressure test.

NOTE — It may be useful and advantageous to carry out more comprehensive testing than is required by this clause ( for example, Charpy V-notch impact tests, chemical analysis and micro-examination ) in order to gain more information and to avoid having to repeat the welding procedure test at a later date just to obtain additional test data. The dimensions of the test piece would probably have to be increased if additional tests were made.

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*Code of practice for magnetic particle flaw detection of welds.

†Code of practice for liquid penetrant flaw detection.

‡Recommended practice for ultrasonic testing of welds in ferritic steel.

§Recommended practice for radiographic examination of fusion welded butt joints in steel plates ( *first revision* ).

‖Recommended practice for radiographic examination of fusion welded circumferential joints in steel pipes.

**TABLE 2 ACCEPTANCE LEVELS — NON-DESTRUCTIVE TESTING**

( *Clause* 7.2.2 )

| DEFECT TYPE | PERMITTED, *Maximum* |
|---|---|
| 1) *Planar Defects* | |
| a) Cracks and lamellar tears | Not permitted |
| b) Root concavity | 0·1 $e$ or 1·2 mm whichever is less |
| c) Lack of root fusion | Not permitted |
| d) Lack of side fusion | Not permitted |
| e) Lack of inter-run fusion | Not permitted |
| f) Lack of root penetration | Not permitted |
| 2) *Cavities* | |
| a) Isolated pores (or individual pores in a group) | $\phi \geqslant e/4$<br>$\phi$ 1·5 mm for $e$ up to and including 25 mm<br>$\phi$ 3·0 mm for $e$ over 25 mm up to and including 50 mm<br>$\phi$ 4·5 mm for $e$ over 50 mm up to and including 75 mm<br>$\phi$ 6·0 mm for $e$ over 75 mm |
| b) Uniformly distributed or localized porosity | 1 percent by area ( as seen in a radiograph ) for $e \geqslant$ 25 mm and *pro rata* for greater thicknesses |
| c) Linear porosity | Linear porosity parallel to the axis of the weld may indicate lack of fusion or lack of penetration and is therefore not permitted |
| d) Wormholes, isolated | $l \geqslant$ 6 mm, $w \geqslant$ 1·5 mm ( as seen in radiograph ) |
| e) Wormholes, aligned | As linear porosity |
| f) Crater pipes | As wormholes isolated |
| 3) *Solid Inclusions* ( *Slag Inclusions* ) | |
| a) Individual and parallel to weld axis ( as seen in the radiograph ) | $e \geqslant$ 18 mm; $l \geqslant e/2 \geqslant$ 6 mm; $w \geqslant$ 1·5 mm<br>$e >$ 18 $\geqslant$ 75 mm; $l \geqslant e/3$; $w \geqslant$ 1·5 mm<br>$e >$ 75 mm; $l \geqslant$ 25 mm; $w \geqslant$ 1·5 mm |
| b) Linear group* | Aggregate length should not exceed 8 percent of length of group, which in turn should not exceed 12$e$ in length |
| c) Individual and randomly orientated ( not parallel to weld axis ) | Maximum dimension in any direction 6 mm |

*Individual inclusions within the group should not exceed the sizes in 3 (a) above. A linear group is defined as a number of inclusions in line and parallel to the weld axis where the spacing between their adjacent ends does not exceed 6 times the length of the longest inclusion within the group. With parallel groups, all inclusions count towards the aggregate.

( *Continued* )

TABLE 2 ACCEPTANCE LEVELS — NON-DESTRUCTIVE TESTING — *Contd*

| DEFECT TYPE | PERMITTED, *Maximum* |
|---|---|
| 4) *Tungsten Inclusions* | |
| a) Isolated | As isolated pores |
| b) Grouped | As uniformly distributed or localized porosity |
| 5) *Copper Inclusions ( Detected by Visual Examination or by Radiography )* | Not permitted |
| 6) *Profile Defects* | |
| a) Undercut | Slight intermittent undercut permitted provided it does not form a sharp notch; depth should not exceed 0·4 mm |
| b) Shrinkage grooves and root concavity | As for undercut, depth should not exceed 1·2 mm |
| c) Excess penetration | $h \geqslant 3$ mm. Occasional local slight excess is allowable |
| d) Reinforcement shape | The reinforcement shall blend smoothly with the parent metal and dressing is not normally required provided the shape does not interfere with the specified NDT techniques |
| e) Overlap | Not permitted |
| f) Linear misalignment | $h \geqslant e/10$, 3 mm |

Abbreviations used:

$e$ = parent metal thickness. In the case of dissimilar thicknesses $e$ applies to the thinner component.

$w$ = width.

$l$ = length.

$h$ = height.

$\phi$ = diameter.

**7.3.2** *Preparation and Testing* — The preparation, shape and dimensions of test specimens and the methods of testing them, except the hardness survey, shall be as specified in IS : 3600-1973*.

The method of hardness testing shall be in accordance with IS : 1501-1968† and the survey shall include at least two traverses of the weld section covering the parent metal and heat-affected zones on each side of the weld as well as the weld metal.

For high temperature applications the all-weld tensile test shall be carried out at the maximum service temperature.

Each bend test specimen shall be bent through at least 90° round a former of a diameter as specified below:

For Group FE1 steels $3t$

*Method of testing fusion welded joints and weld metal in steel (*first revision*).

†Method for Vickers hardness test for steel (*first revision*).

| | |
|---|---|
| For Group FE2 steels | $4t$ |
| For other steels | A diameter equal to $1t$ greater than that required to test the parent metal of the same thickness |

where $t$ is the thickness of the specimen.

**7.3.3** *Test Results*

a) *Macro-examination and fillet weld fracture test* — The etched face for macro-examination and the fracture surface from the fillet weld test shall be assessed in accordance with the requirements of **7.2.2**.

b) *Hardness survey* — The results from the hardness survey shall be recorded.

c) *Transverse tensile test* — The tensile strength shall be not less than the corresponding minimum value for the parent metal and the location of the fracture shall be recorded.

d) *All-weld tensile test* — The tensile strength and yield stress shall be recorded. Depending on which parameter the design criteria are based, either the tensile strength or the yield stress shall be not less than the corresponding minimum values for the parent metal. The tensile strength shall not exceed by more than 20 percent of the maximum value specified.

NOTE — The design criteria are based on either yield stress or tensile strength.

The elongation shall be not less than 16 percent or 0·8 times the minimum value for the parent metal whichever is the greater.

When relevant, the high temperature values of these properties shall be not less than the corresponding values for the parent metal at the appropriate temperature.

e) *Bend tests* — On completion of bending, any defects exceeding 3 mm at the outer surface of the test specimen shall be investigated and their cause established before the specimens are accepted. Slight tearing at the corners of the test specimen shall not be the cause for rejection.

## 8. STATEMENT OF RESULTS

**8.1** A statement of the results of assessing each test piece, including repeat tests, shall be made for each welding procedure. The items required under **3** shall be included together with details of any features that would be rejectable by the requirements of **7.2.2** and of the test results in accordance with **7.3.3**. If no rejectable features or test results are found, a statement that the test piece made according to the particular welding procedure satisfied the requirements of this standard in respect of that type of test piece shall be signed by the person conducting the test ( *see also* Appendix A ).

It is recommended that welding procedure tests carried out in accordance with this standard and witnessed by an independent inspecting authority should be accepted by other inspecting authorities provided that all the provisions have been fulfilled.

# APPENDIX A

( *Clause* 8.1 )

## TYPICAL WELDING PROCEDURE TEST RECORD

## TEST RECORD OF SHOP*/SITE* WELD PROCEDURE

| **Manufacturer's Name** | **Procedure No.** |
|---|---|
| Weld preparation | Run sequence and completed weld dimensions |
| ( Sketch ) ( State method and fit-up ) | ( Sketch ) |
| Dimensions of test piece | Parent material( s ) |
| Welding position | Position of test piece |
| Pre-heating and interpass temperature, method and control | Post-weld heat treatment temperature, method and control |

**Welding Consumables**

| *Filler material* | *Shielding gas/flux* |
|---|---|
| Make<br>Type<br>Composition<br>Size | Type of flux<br>Composition of gas<br>Flow rate |
| Travel speed ( mechanized welding ) | Back gouging |
| Welding process( es ) | |
| Additional information | |
| Drafted by date | |
| Approved by | Revision |

*Delete as necessary.

*Test Results for Procedure No.*

| Type of test ( Delete any not required ) | *State* : — Satisfactory, unsatisfactory or not approved except where numerical results are obtained | | | |
|---|---|---|---|---|
| Non-destructive tests | | | | |
| Visual | | | | |
| Magnetic particle | | | | |
| Penetrant | | | | |
| Radiography/Ultrasonics | | | | |
| Destructive tests | | | | |
| Transverse tensile | Tensile strength | Yield stress | Location of fracture | |
| All-weld tensile | Tensile strength | Yield stress | 0·2% proof stress | Elongation % |
| Guided bend tests<br>Root Side Face | | | | |
| Root Side Face | | | | |
| Root Side Face | | | | |
| Root Side Face | | | | |
| Fillet weld fracture | | | | |
| Macro-examination | | | | |
| Hardness survey | | | | |
| Additional tests | | | | |
| Remarks | | | | |
| Inspecting authority<br>Witnessed by<br>Date | Manufacturer's signature<br>Position<br>Date | | | |

( *Continued from page* 2 )

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